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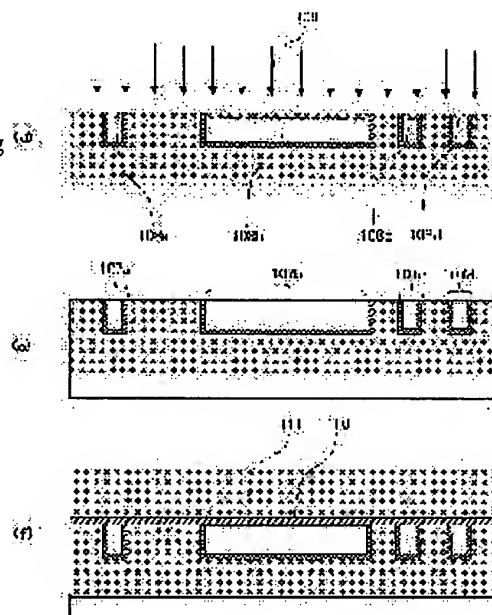
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## (54) METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a method of manufacturing a semiconductor device by the elimination of a copper oxide ( $\text{Cu}_2\text{O}$ ) 108a or the like formed on the surface of copper in a damascene copper interconnection 107a or the like by a plasma  $\text{CH}_4$  treatment 109 and the capping of the surface with a plasma silicon nitride film 110 without exposing the surface to the air.

**SOLUTION:** The existence of a copper oxide causes an easy separation of a silicon nitride film, especially a plasma silicon nitride film of a larger area on a copper interconnection. A poor adhesion causes copper atoms to move easily in an interface, and cause the deterioration in electromigration. In order to avoid this problem, the surface is treated with a plasma  $\text{CH}_4$ . Carbon atoms absorbed by the surface selectively remove oxygen from the copper oxide and then become volatile CO molecules to be easily removed from the surface of the copper interconnection. Carbon also works as a reducing agent for hydrogen and therefore a reducing action by hydrogen can be increased.



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